

# OSPF虚拟链路

## Contents

[Introduction](#)

[Prerequisites](#)

[Requirements](#)

[Components Used](#)

[Conventions](#)

[Configure](#)

[Network Diagram](#)

[配置](#)

[虚链路如何运行](#)

[计算最短路径](#)

[使用而不是虚链路的一个GRE封装隧道](#)

[Verify](#)

[检查OSPF数据库](#)

[Troubleshoot](#)

[故障排除命令](#)

[Related Information](#)

## Introduction

开放最短路径优先 (OSPF) 自治系统中的所有区域都必须以物理方式与主干区域 (区域 0) 相连。在无法实现这种连接的情况下，可利用虚拟链路来通过非主干区域连接到主干网。您还可利用虚拟链路来通过非主干区域连接一个主干网中分割而成的两个部分。配置虚拟链路所使用的区域称为中转区域，这种区域必须具有全部路由信息。中转区域不能是末节区域。本文档对虚拟链路环境中的 OSPF 数据库进行了说明。[有关虚拟链路的详细信息，请参阅 OSPF 设计指南。](#)

## Prerequisites

### Requirements

Cisco 建议您了解以下主题：

- [配置 OSPF](#)
- [OSPF 区域间路由](#)

### Components Used

本文档不限于特定的软件或硬件版本。

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

## Conventions

Refer to [Cisco Technical Tips Conventions](#) for more information on document conventions.

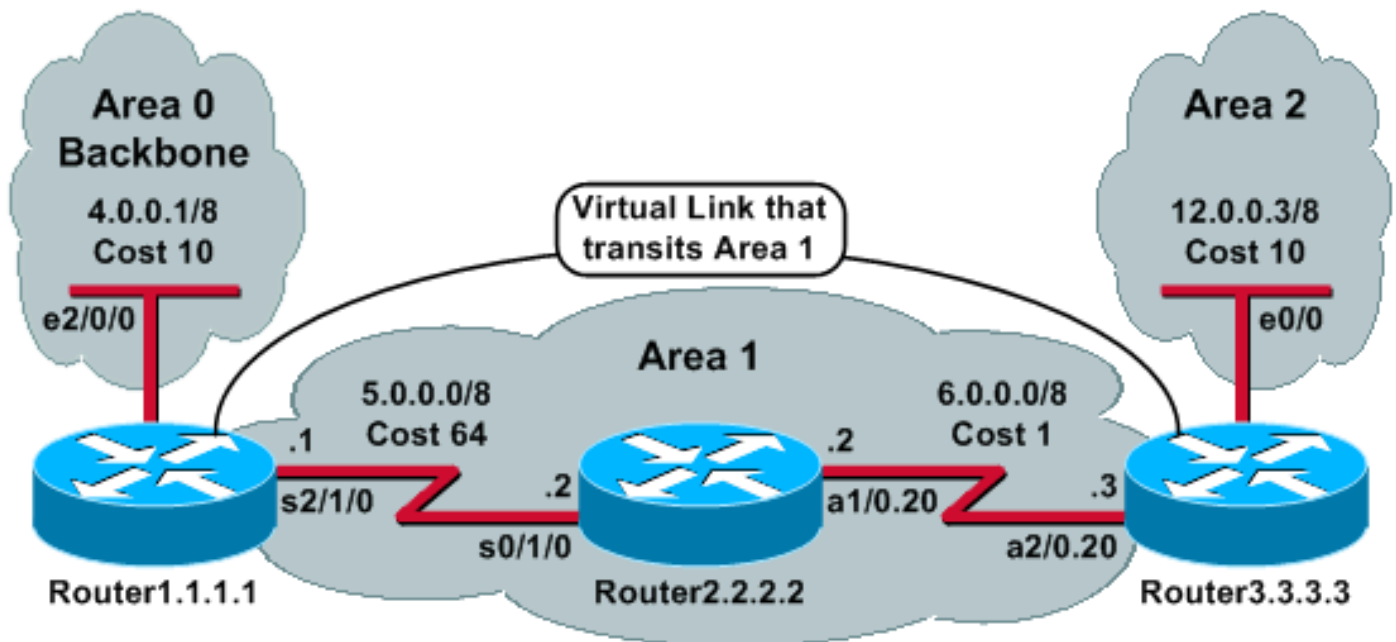
## Configure

本部分提供有关如何配置本文档所述功能的信息。

**Note:** 有关本文档所用命令的详细信息，请使用[命令查找工具](#)（[仅限注册用户](#)）。

## Network Diagram

本文档使用以下网络设置：



## 配置

本文档使用以下配置：

- [Router1.1.1.1](#)
- [Router2.2.2.2](#)
- [Router3.3.3.3](#)

### Router1.1.1.1

Current configuration:

```
hostname Router1.1.1.1
```

```
interface Loopback0
```

```
ip address 1.1.1.1 255.0.0.0

interface Ethernet2/0/0
ip address 4.0.0.1 255.0.0.0

interface Serial2/1/0
ip address 5.0.0.1 255.0.0.0

router ospf 2
network 4.0.0.0 0.255.255.255 area 0
network 5.0.0.0 0.255.255.255 area 1
area 1 virtual-link 3.3.3.3
!--- Area 1 is the transit area. !--- IP address 3.3.3.3
is the router !--- ID of the router between Area 1 !---
and Area 2 (Router3.3.3.3). See !--- the next Note. end
```

**Note:** 如果一个存在，OSPF路由器ID通常是在机箱或最较高的环回地址的最高的IP地址。路由器ID只被计算在启动时间或在任何时间OSPF进程被重新启动。发出[show ip ospf interface](#)命令查找路由器ID。

### Router2.2.2.2

Current configuration:

```
hostname Router2.2.2.2

interface Loopback0
ip address 2.2.2.2 255.0.0.0

interface Serial0/1/0
ip address 5.0.0.2 255.0.0.0

interface ATM1/0.20 point-to-point
ip address 6.0.0.2 255.0.0.0

router ospf 2
network 6.0.0.0 0.255.255.255 area 1
network 5.0.0.0 0.255.255.255 area 1

end
```

### Router3.3.3.3

Current configuration:

```
hostname Router3.3.3.3

interface Loopback0
ip address 3.3.3.3 255.0.0.0

interface Ethernet0/0
ip address 12.0.0.3 255.0.0.0

interface ATM2/0.20 point-to-point
ip address 6.0.0.3 255.0.0.0

router ospf 2
network 12.0.0.0 0.255.255.255 area 2
network 6.0.0.0 0.255.255.255 area 1
area 1 virtual-link 1.1.1.1
!--- Area 1 is the transit area. !--- IP address 1.1.1.1
is the router !--- ID of the router between Area 1 !---
```

```
and Area 0 (Router1.1.1.1). end
```

## 虚链路如何运行

最初，虚链路发生故障，因为Router1.1.1.1不会到达Router3.3.3.3 (虚链路的另一个末端)。所有在第1区需要的Link State Advertisement (LSA)被充斥和Shortest Path First (SPF)算法必须在第1区内由所有三路由器负责， Router1.1.1.1的能会通过第1.区到达Router3.3.3.3。

在路由器会通过中转区域后互相到达，他们设法形成在虚链路间的邻接。在虚链路之间的二末端的OSPF信息包不是组播信息包。因为他们被建立隧道对虚链路的另一个末端，他们是自来源5.0.0.1的隧道信息包对目的地6.0.0.3。请注意，如果有在虚拟链路路由器之间的一防火墙，您需要enable (event)在5.0.0.1和6.0.0.3之间的虚拟链路隧道流出的接口IP之间的OSPF (IP协议89)端口。

一旦路由器变得相邻在虚链路， Router3.3.3.3认为自己区域边界路由器(ABR)，因为结果当前有一条链路在Area 0。 ， Router3.3.3.3创建12.0.0.0/8的一个汇总LSA在Area 0和在第1.区。

由于某种原因如果虚链路是不正确的配置的，则Router3.3.3.3不认为自己ABR，因为没有在Area 0的任何接口。如果这是实际情形，不创建汇总LSA也不通告12.0.0.0/8到第1.区。

**Note:** OSPF运行在它上面IP并且使用协议号89。OSPF不依靠任何其他传输协议，例如TCP和UDP。

## 计算最短路径

此部分从Router2.2.2.2的角度计算最短路径。

Router2.2.2.2在其自己的LSA查找并且看到Router3.3.3.3是相邻。它然后查看Router3.3.3.3 LSA验证Router3.3.3.3看到Router2.2.2.2作为相邻。如果两路由器互相看到作为相邻，则他们认为可达到。

每个路由器也检查您能用[show ip ospf neighbor命令](#)看到)的其本地邻接表(验证其接口和相邻的接口在一个普通的IP子网)。

**Note:** 此检查在未编号的接口没有被执行。

如果他们在一个普通的子网，所有末端网络的路由器安装路由在他们的相邻路由器LSA列出了。在本例中， 6.0.0.0/8是在Router3.3.3.3 LSA列出的唯一的stub网络在第1区， Router2.2.2.2已经直接地被连接。

Router3.3.3.3执行Router1.1.1.1 LSA的同一个考试，但是没有在Router1.1.1.1 LSA的所有有用的末端网络。

在所有可达路由器LSA在第1区被检查后， Router2.2.2.2查看在数据库的汇总LSA。它查找12.0.0.0/8的两个汇总LSA在第1区并且选择那个以最低的总费用，是到达通告路由器的权值加上汇总LSA的权值。

- Router2.2.2.2能通过Router1.1.1.1到达12.0.0.0以一费用的 $64 + 75 = 139$ 。
- Router2.2.2.2能通过Router3.3.3.3到达12.0.0.0以一费用的 $1 + 10 = 11$ 。

Router2.2.2.2在其路由表里安装一个路由通过与权值的Router3.3.3.3 11。

此输出在以前被描述的每个路由器里路由表显示OSPF路由：

```

Router1.1.1.1#show ip route ospf
!--- Output suppressed. O 6.0.0.0/8 [110/65] via 5.0.0.2, 00:38:12, Serial2/1/0 O IA 12.0.0.0/8
[110/75] via 5.0.0.2, 00:38:02, Serial2/1/0 Router2.2.2.2#show ip route ospf
!--- Output suppressed. O IA 4.0.0.0/8 [110/74] via 5.0.0.1, 00:38:08, Serial0/1/0 O IA
12.0.0.0/8 [110/11] via 6.0.0.3, 00:38:12, ATM1/0.20
!--- This is the route in this example. Router3.3.3.3#show ip route ospf
!--- Output suppressed. O 4.0.0.0/8 [110/75] via 6.0.0.2, 00:38:18, ATM2/0.20 O 5.0.0.0/8
[110/65] via 6.0.0.2, 00:38:28, ATM2/0.20

```

## 使用而不是虚链路的GRE封装隧道

您在Area 0能也构建在Router1.1.1.1和Router3.3.3.3之间的一条通用路由封装(GRE)隧道和放置隧道。GRE封装隧道和虚链路之间的主要区别在此表描述：

GRE封装隧道	虚拟链路
在隧道的所有数据流由隧道终点封装并且解封装。	路由更新被建立隧道，但是本地发送数据流量。
在顶上每个信息包的原因的隧道报头。	数据流量不是受顶上任何的隧道支配。
隧道可以通过末端区域。	因为路由器在末端区域没有外部目的地的，路由中转区域不可以是末端区域。由于本地发送数据，如果为一个外部目的地注定的信息包被发送到也是中转区域的末端区域，然后信息包没有正确地路由。路由器在末端区域没有特定外部目的地的路由。

## Verify

Use this section to confirm that your configuration works properly.

[命令输出解释程序 \( 仅限注册用户 \)](#) (OIT) 支持某些 **show** 命令。使用 OIT 可查看对 show 命令输出的分析。

- [show ip ospf database](#) —显示LSA列表并且键入他们到一个链路状态数据库。此列表在LSA报头显示仅信息。
- —显示所有列表一个路由器的[LSA在数据库的](#)。LSA是由每个路由器生产的。这些根本LSA与状态和链路流出开销一起列出所有路由器或接口的链路，并且他们在他们产生的区域内仅被充斥。
- —显示仅信息关于在[数据库的网络汇总LSA](#)。

- [show ip ospf database \[summary\] \[self-originate\]](#) —显示仅自己生成的LSA (从本地路由器)。

## 检查OSPF数据库

这是OSPF数据库如何看起来给出此网络环境，当您发出show ip ospf database命令时。

Router1.1.1.1#show ip ospf database

OSPF Router with ID (1.1.1.1) (Process ID 2)

Router Link States (Area 0)

Link ID	ADV Router	Age	Seq#	Checksum	Link count
1.1.1.1	1.1.1.1	919	0x80000003	0xD5DF	2
3.3.3.3	3.3.3.3	5 (DNA)	0x80000002	0x3990	1

Summary Net Link States (Area 0)

Link ID	ADV Router	Age	Seq#	Checksum
5.0.0.0	1.1.1.1	1945	0x80000002	0xAA48
5.0.0.0	3.3.3.3	9 (DNA)	0x80000001	0x7A70
6.0.0.0	1.1.1.1	1946	0x80000002	0xA749
6.0.0.0	3.3.3.3	9 (DNA)	0x80000001	0xEA3F
12.0.0.0	3.3.3.3	9 (DNA)	0x80000001	0xF624

Router Link States (Area 1)

Link ID	ADV Router	Age	Seq#	Checksum	Link count
1.1.1.1	1.1.1.1	1946	0x80000005	0xDDA6	2
2.2.2.2	2.2.2.2	10	0x80000009	0x64DD	4
3.3.3.3	3.3.3.3	930	0x80000006	0xA14C	2

Summary Net Link States (Area 1)

Link ID	ADV Router	Age	Seq#	Checksum
4.0.0.0	1.1.1.1	1947	0x80000002	0x9990
4.0.0.0	3.3.3.3	911	0x80000001	0xEBF5
12.0.0.0	1.1.1.1	913	0x80000001	0xBF22
12.0.0.0	3.3.3.3	931	0x80000001	0xF624

Router2.2.2.2#show ip ospf database

OSPF Router with ID (2.2.2.2) (Process ID 2)

Router Link States (Area 1)

Link ID	ADV Router	Age	Seq#	Checksum	Link count
1.1.1.1	1.1.1.1	1988	0x80000005	0xDDA6	2
2.2.2.2	2.2.2.2	50	0x80000009	0x64DD	4
3.3.3.3	3.3.3.3	969	0x80000006	0xA14C	2

Summary Net Link States (Area 1)

Link ID	ADV Router	Age	Seq#	Checksum
4.0.0.0	1.1.1.1	1988	0x80000002	0x9990
4.0.0.0	3.3.3.3	950	0x80000001	0xEBF5
12.0.0.0	1.1.1.1	955	0x80000001	0xBF22
12.0.0.0	3.3.3.3	970	0x80000001	0xF624

Router3.3.3.3#show ip ospf database

OSPF Router with ID (3.3.3.3) (Process ID 2)

Router Link States (Area 0)

Link ID	ADV Router	Age	Seq#	Checksum	Link count
1.1.1.1	1.1.1.1	6 (DNA)	0x80000003	0xD5DF	2
3.3.3.3	3.3.3.3	977	0x80000002	0x3990	1

Summary Net Link States (Area 0)

Link ID	ADV Router	Age	Seq#	Checksum
5.0.0.0	1.1.1.1	1027 (DNA)	0x80000002	0xAA48
5.0.0.0	3.3.3.3	986	0x80000001	0x7A70
6.0.0.0	1.1.1.1	1027 (DNA)	0x80000002	0xA749
6.0.0.0	3.3.3.3	987	0x80000001	0xEA3F
12.0.0.0	3.3.3.3	987	0x80000001	0xF624

Router Link States (Area 1)

Link ID	ADV Router	Age	Seq#	Checksum	Link count
1.1.1.1	1.1.1.1	2007	0x80000005	0xDDA6	2
2.2.2.2	2.2.2.2	68	0x80000009	0x64DD	4
3.3.3.3	3.3.3.3	987	0x80000006	0xA14C	2

Summary Net Link States (Area 1)

Link ID	ADV Router	Age	Seq#	Checksum
4.0.0.0	1.1.1.1	2007	0x80000002	0x9990
4.0.0.0	3.3.3.3	967	0x80000001	0xEBF5
12.0.0.0	1.1.1.1	973	0x80000001	0xBF22
12.0.0.0	3.3.3.3	987	0x80000001	0xF624

Router Link States (Area 2)

Link ID	ADV Router	Age	Seq#	Checksum	Link count
3.3.3.3	3.3.3.3	987	0x80000003	0xCF5	1

Summary Net Link States (Area 2)

Link ID	ADV Router	Age	Seq#	Checksum
4.0.0.0	3.3.3.3	968	0x80000001	0xEBF5
5.0.0.0	3.3.3.3	988	0x80000001	0x7A70
6.0.0.0	3.3.3.3	988	0x80000001	0xEA3F

注意通过虚链路了解的LSA有DoNotAge选项。虚链路对待类似需求电路。

Router1.1.1.1#show ip ospf database router 1.1.1.1

OSPF Router with ID (1.1.1.1) (Process ID 2)

Router Link States (Area 0)

```
LS age: 1100
Options: (No TOS-capability, DC)
LS Type: Router Links
Link State ID: 1.1.1.1
!--- For router links, Link State ID is always the same as the Advertising Router. Advertising
Router: 1.1.1.1
!--- This is the router ID of the router that created this LSA. LS Seq Number: 80000003
Checksum: 0xD5DF Length: 48 Area Border Router
!--- Bit B in the router LSA indicates that this router is an ABR. Number of Links: 2
!--- There are two links in Area 0. Link connected to: a Virtual Link (Link ID) Neighboring
Router ID: 3.3.3.3
```

```
!--- Router ID of the neighbor on the other end of the virtual link. (Link Data) Router
Interface address: 5.0.0.1
!--- The interface that this router uses to send packets to the neighbor. Number of TOS metrics:
0 TOS 0 Metrics: 65
!--- The metric comes from the cost for this router to reach the neighboring router: !--- the
ATM link has a cost of 1 and the serial link has a cost of 64. Link connected to: a Stub Network
!--- This represents the Ethernet segment 4.0.0.0/8. (Link ID) Network/subnet number: 4.0.0.0
(Link Data) Network Mask: 255.0.0.0 Number of TOS metrics: 0 TOS 0 Metrics: 10 Router Link
States (Area 1) LS age: 122 Options: (No TOS-capability, DC) LS Type: Router Links Link State
ID: 1.1.1.1 Advertising Router: 1.1.1.1 LS Seq Number: 80000006 Checksum: 0xDBA7 Length: 48 Area
Border Router Number of Links: 2
!--- There are two links in Area 1. Link connected to: another Router (point-to-point) (Link ID)
Neighboring Router ID: 2.2.2.2 (Link Data) Router Interface address: 5.0.0.1 Number of TOS
metrics: 0 TOS 0 Metrics: 64 Link connected to: a Stub Network (Link ID) Network/subnet number:
5.0.0.0 (Link Data) Network Mask: 255.0.0.0 Number of TOS metrics: 0 TOS 0 Metrics: 64
Router1.1.1.1#show ip ospf database router 2.2.2.2
```

OSPF Router with ID (1.1.1.1) (Process ID 2)

Router Link States (Area 1)

```
LS age: 245
Options: (No TOS-capability, DC)
LS Type: Router Links
Link State ID: 2.2.2.2
Advertising Router: 2.2.2.2
LS Seq Number: 80000009
Checksum: 0x64DD
Length: 72
```

**Number of Links: 4**

```
!--- There are four links in Area 1. Link connected to: another Router (point-to-point) (Link
ID) Neighboring Router ID: 3.3.3.3 (Link Data) Router Interface address: 6.0.0.2 Number of TOS
metrics: 0 TOS 0 Metrics: 1 Link connected to: a Stub Network (Link ID) Network/subnet number:
6.0.0.0 (Link Data) Network Mask: 255.0.0.0 Number of TOS metrics: 0 TOS 0 Metrics: 1 Link
connected to: another Router (point-to-point) (Link ID) Neighboring Router ID: 1.1.1.1 (Link
Data) Router Interface address: 5.0.0.2 Number of TOS metrics: 0 TOS 0 Metrics: 64 Link
connected to: a Stub Network (Link ID) Network/subnet number: 5.0.0.0 (Link Data) Network Mask:
255.0.0.0 Number of TOS metrics: 0 TOS 0 Metrics: 64 Router1.1.1.1#show ip ospf database router
3.3.3.3
```

OSPF Router with ID (1.1.1.1) (Process ID 2)

Router Link States (Area 0)

```
Routing Bit Set on this LSA
LS age: 5 (DoNotAge)
Options: (No TOS-capability, DC)
LS Type: Router Links
Link State ID: 3.3.3.3
Advertising Router: 3.3.3.3
LS Seq Number: 80000002
Checksum: 0x3990
Length: 36
Area Border Router
```

**Number of Links: 1**

```
!--- There is one link in Area 0. Link connected to: a Virtual Link (Link ID) Neighboring Router
ID: 1.1.1.1 (Link Data) Router Interface address: 6.0.0.3
Number of TOS metrics: 0
TOS 0 Metrics: 65
```

Router Link States (Area 1)

```
Routing Bit Set on this LSA
LS age: 1137
```



```
Options: (No TOS-capability, DC)
LS Type: Router Links
Link State ID: 3.3.3.3
Advertising Router: 3.3.3.3
LS Seq Number: 80000006
Checksum: 0xA14C
Length: 48
Area Border Router
```

**Number of Links: 2**

*!--- There are two links in Area 1.* Link connected to: another Router (point-to-point) (Link ID) Neighboring Router ID: 2.2.2.2 (Link Data) Router Interface address: 6.0.0.3 Number of TOS metrics: 0 TOS 0 Metrics: 1 Link connected to: a Stub Network (Link ID) Network/subnet number: 6.0.0.0 (Link Data) Network Mask: 255.0.0.0 Number of TOS metrics: 0 TOS 0 Metrics: 1  
Router3.3.3.3认为自己ABR，因为有Area 0 (虚链路)的一条链路。结果，它生成12.0.0.0的一个汇总LSA到第1区和Area 0，您能看到，当您发出[show ip ospf database summary命令](#)时。

```
Router3.3.3.3#show ip ospf database summary 12.0.0.0
```

```
OSPF Router with ID (3.3.3.3) (Process ID 2)
```

```
Summary Net Link States (Area 0)
```

```
LS age: 1779
Options: (No TOS-capability, DC)
LS Type: Summary Links(Network)
Link State ID: 12.0.0.0 (summary Network Number)
Advertising Router: 3.3.3.3
LS Seq Number: 80000001
Checksum: 0xF624
Length: 28
Network Mask: /8
TOS: 0 Metric: 10
```

```
Summary Net Link States (Area 1)
```

```
LS age: 1766
Options: (No TOS-capability, DC)
LS Type: Summary Links(Network)
Link State ID: 12.0.0.0 (summary Network Number)
Advertising Router: 1.1.1.1
LS Seq Number: 80000001
Checksum: 0xBF22
Length: 28
Network Mask: /8
TOS: 0 Metric: 75
```

```
LS age: 1781
Options: (No TOS-capability, DC)
LS Type: Summary Links(Network)
Link State ID: 12.0.0.0 (summary Network Number)
Advertising Router: 3.3.3.3
LS Seq Number: 80000001
Checksum: 0xF624
Length: 28
Network Mask: /8
TOS: 0 Metric: 10
```

并且，请注意Router3.3.3.3在第2区创建汇总LSA从Area 0和区域1.了解的所有的信息。

```
Router3.3.3.3#show ip ospf database summary self-originate
```

OSPF Router with ID (3.3.3.3) (Process ID 2)

Summary Net Link States (Area 0)

LS age: 155  
Options: (No TOS-capability, DC)  
LS Type: Summary Links(Network)  
Link State ID: 5.0.0.0 (summary Network Number)  
Advertising Router: 3.3.3.3  
LS Seq Number: 80000002  
Checksum: 0x7871  
Length: 28  
Network Mask: /8  
TOS: 0 Metric: 65

LS age: 155  
Options: (No TOS-capability, DC)  
LS Type: Summary Links(Network)  
Link State ID: 6.0.0.0 (summary Network Number)  
Advertising Router: 3.3.3.3  
LS Seq Number: 80000002  
Checksum: 0xE840  
Length: 28  
Network Mask: /8  
TOS: 0 Metric: 1

LS age: 156  
Options: (No TOS-capability, DC)  
LS Type: Summary Links(Network)  
Link State ID: 12.0.0.0 (summary Network Number)  
Advertising Router: 3.3.3.3  
LS Seq Number: 80000002  
Checksum: 0xF425  
Length: 28  
Network Mask: /8  
TOS: 0 Metric: 10

Summary Net Link States (Area 1)

LS age: 157  
Options: (No TOS-capability, DC)  
LS Type: Summary Links(Network)  
Link State ID: 4.0.0.0 (summary Network Number)  
Advertising Router: 3.3.3.3  
LS Seq Number: 80000002  
Checksum: 0xE9F6  
Length: 28  
Network Mask: /8  
TOS: 0 Metric: 75

LS age: 165  
Options: (No TOS-capability, DC)  
LS Type: Summary Links(Network)  
Link State ID: 12.0.0.0 (summary Network Number)  
Advertising Router: 3.3.3.3  
LS Seq Number: 80000002  
Checksum: 0xF425  
Length: 28  
Network Mask: /8  
TOS: 0 Metric: 10

Summary Net Link States (Area 2)

LS age: 167

```
Options: (No TOS-capability, DC)
LS Type: Summary Links(Network)
Link State ID: 4.0.0.0 (summary Network Number)
Advertising Router: 3.3.3.3
LS Seq Number: 80000002
Checksum: 0xE9F6
Length: 28
Network Mask: /8
    TOS: 0 Metric: 75
```

```
LS age: 168
Options: (No TOS-capability, DC)
LS Type: Summary Links(Network)
Link State ID: 5.0.0.0 (summary Network Number)
Advertising Router: 3.3.3.3
LS Seq Number: 80000002
Checksum: 0x7871
Length: 28
Network Mask: /8
    TOS: 0 Metric: 65
```

```
LS age: 168
Options: (No TOS-capability, DC)
LS Type: Summary Links(Network)
Link State ID: 6.0.0.0 (summary Network Number)
Advertising Router: 3.3.3.3
LS Seq Number: 80000002
Checksum: 0xE840
Length: 28
Network Mask: /8
    TOS: 0 Metric: 1
```

## Troubleshoot

使用本部分可排除配置故障。

### 故障排除命令

[命令输出解释程序 \(仅限注册用户\)](#) (OIT) 支持某些 **show** 命令。使用 OIT 可查看对 **show** 命令输出的分析。

**Note:** 使用 **debug** 命令之前，请参阅[有关 Debug 命令的重要信息](#)。

- **debug ip ospf adj** —显示介入的事件构建或中断OSPF邻接。

路由器变得相邻并且通过虚链路交换LSA，类似于一条物理链路。如果检查路由器LSA或输出的**debug ip ospf adj**命令，您能看到邻接：

```
Router3.3.3.3#
May 26 17:25:03.089: OSPF: Rcv hello from 1.1.1.1 area 0 from OSPF_VL3 5.0.0.1
May 26 17:25:03.091: OSPF: 2 Way Communication to 1.1.1.1 on OSPF_VL3, state 2WAY
May 26 17:25:03.091: OSPF: Send DBD to 1.1.1.1 on OSPF_VL3
                        seq 0xD1C opt 0x62 flag 0x7 len 32
May 26 17:25:03.135: OSPF: End of hello processing
May 26 17:25:03.139: OSPF: Rcv DBD from 1.1.1.1 on OSPF_VL3
                        seq 0x1617 opt 0x22 flag 0x7 len 32
                        mtu 0 state EXSTART
May 26 17:25:03.175: OSPF: First DBD and we are not SLAVE
May 26 17:25:03.179: OSPF: Rcv DBD from 1.1.1.1 on OSPF_VL3
```

```

seq 0xD1C opt 0x22 flag 0x2 len 172
mtu 0 state EXSTART
May 26 17:25:03.183: OSPF: NBR Negotiation Done. We are the MASTER
May 26 17:25:03.189: OSPF: Send DBD to 1.1.1.1 on OSPF_VL3
seq 0xD1D opt 0x62 flag 0x3 len 172
May 26 17:25:03.191: OSPF: Database request to 1.1.1.1
May 26 17:25:03.191: OSPF: sent LS REQ packet to 5.0.0.1, length 36
May 26 17:25:03.263: OSPF: Rcv DBD from 1.1.1.1 on OSPF_VL3
seq 0xD1D opt 0x22 flag 0x0 len 32
mtu 0 state EXCHANGE
May 26 17:25:03.267: OSPF: Send DBD to 1.1.1.1 on OSPF_VL3
seq 0xD1E opt 0x62 flag 0x1 len 32
May 26 17:25:03.311: OSPF: Rcv DBD from 1.1.1.1 on OSPF_VL3
seq 0xD1E opt 0x22 flag 0x0 len 32
mtu 0 state EXCHANGE
May 26 17:25:03.311: OSPF: Exchange Done with 1.1.1.1 on OSPF_VL3
May 26 17:25:03.315: OSPF: Synchronized with 1.1.1.1 on OSPF_VL3, state FULL
May 26 17:25:03.823: OSPF: Build router LSA for area 0,
router ID 3.3.3.3, seq 0x80000029
May 26 17:25:03.854: OSPF: Dead event ignored for 1.1.1.1 on demand circuit OSPF_VL3

```

```
Router3.3.3.3#show ip ospf neighbor
```

Neighbor ID	Pri	State	Dead Time	Address	Interface
2.2.2.2	1	FULL/ -	00:00:38	6.0.0.2	ATM2/0.20

```
Router3.3.3.3#show ip ospf virtual-links
```

```
Virtual Link OSPF_VL3 to router 1.1.1.1 is up
```

```
Run as demand circuit
```

```
DoNotAge LSA allowed.
```

```
Transit area 1, via interface ATM2/0.20, Cost of using 65
```

```
Transmit Delay is 1 sec, State POINT_TO_POINT,
```

```
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
```

```
Hello due in 00:00:01
```

```
Adjacency State FULL (Hello suppressed)
```

```
Index 1/2, retransmission queue length 0, number of retransmission 0
```

```
First 0x0(0)/0x0(0) Next 0x0(0)/0x0(0)
```

```
Last retransmission scan length is 0, maximum is 0
```

```
Last retransmission scan time is 0 msec, maximum is 0 msec
```

注意在虚链路的邻接在[show ip ospf neighbor命令](#)输出中没有显示。看到他们的唯一方法是查看路由器LSA和观察调试指令，因为邻接出来，或者发出[show ip ospf virtual-links命令](#)。

## [Related Information](#)

- [什么是OSPF区域和虚链路？](#)
- [在虚拟链路上配置 OSPF 认证](#)
- [配置在IPSec的一个GRE封装隧道使用OSPF](#)
- [什么show ip ospf interface命令显示？](#)
- [OSPF如何传播外部路由到多个区域](#)
- [OSPF数据库说明指南](#)
- [OSPF 支持页](#)
- [IP 路由协议支持页](#)
- [IP 路由支持页](#)
- [Technical Support & Documentation - Cisco Systems](#)